Claims

What is claimed is:

1. A device, comprising:

a substrate to support a mesa;

a first waveguide formed on said mesa and having one tapered end section which adiabatically transforms an optical mode guided in said first waveguide; and

a second waveguide formed on said substrate and having a cross section larger than said first waveguide and a refractive index less than said first waveguide, said second waveguide having one waveguide section in which said first waveguide and said mesa are conformingly embedded to place said first waveguide near a center of said second waveguide.

2. The device as in claim 1, wherein said first waveguide comprises silicon.

3. The device as in claim 1, wherein said first waveguide comprises amorphous silicon.

4. The device as in claim 1, wherein said first waveguide comprises silicon nitride.

5. The device as in claim 1, wherein said first waveguide comprises silicon carbide.

6. The device as in claim 1, wherein said first waveguide comprises titanium oxide.

7. The device as in claim 1, wherein said second waveguide comprises a polymer material.

8. The device as in claim 1, wherein said second waveguide comprises fluorinated polyimide.

9. The device as in claim 1, wherein said second waveguide comprises acrylate.

10. The device as in claim 1, wherein said second waveguide comprises polymethyl methacrylate (PMMA).

11. The device as in claim 1, wherein said second waveguide comprises polysiloxane.

12. The device as in claim 1, wherein said second waveguide comprises silicon oxynitride.

13. The device as in claim 1, wherein said second waveguide comprises titanium oxide.

14. The device as in claim 1, wherein said second waveguide comprises a glass material.

15. The device as in claim 1, wherein said substrate comprises a semiconductor material.

16. The device as in claim 1, wherein said substrate comprises a polymer material.

17. The device as in claim 1, wherein said substrate comprises a glass material.

18. The device as in claim 1, wherein said substrate comprises quartz.

19. The device as in claim 1, wherein said tapered end section has a cross section that gradually increases in a direction towards a distal end of said tapered end section.

20. The device as in claim 1, wherein said tapered end section has a cross section that gradually decreases in a direction towards a distal end of said tapered end section.

21. The device as in claim 1, further comprising a cladding layer formed on said substrate, and wherein said mesa is formed in said cladding layer.

22. The device as in claim 21, wherein said substrate is made from silicon and said cladding layer comprises a silicon oxide material.

23. A device, comprising:

a cladding layer having a mesa;

a first waveguide core, whose index is greater than said cladding layer, formed on said mesa and having a tapered end section to adiabatically transform a mode of guided light; and

a second waveguide core with a cross section greater than a cross section of and an index less than an index of said first

waveguide core, said second waveguide core formed over said cladding layer and said first waveguide core to have a solid section and a hollow section, said hollow section having an opening to conformingly enclose said tapered end section and said mesa to surround said tapered end section by said mesa and said second waveguide core.

24. The device as in claim 23, wherein said mesa has a height to position said first waveguide at or near a center of said hollow section of said second waveguide core.

25. The device as in claim 23, wherein said tapered section gradually increases a cross section in a direction from said hollow section to said solid section.

26. The device as in claim 23, wherein said tapered section gradually decreases a cross section in a direction from said hollow section to said solid section.

27. A device, comprising:

a first waveguide to guide an input light beam;

a substrate fabricated to comprise an input optical coupler to receive said input light beam and a second waveguide to

receive light from said input optical coupler, said first waveguide coupled to said input optical coupler to direct light to said second waveguide,

wherein said input optical coupler comprises:

a cladding layer having a mesa, a first waveguide core, whose index is greater than said cladding layer, formed on said mesa and having a tapered end section to adiabatically transform a mode of guided light, said first waveguide core optically coupled to said first waveguide, and

a second waveguide core with a cross section greater than a cross section of and an index less than an index of said first waveguide core, said second waveguide core formed over said cladding layer and said first waveguide core to conformingly enclose said tapered end section near or at a center of said second waveguide core, said second waveguide core optically coupled to said second waveguide.

28. The device as in claim 27, further comprising an optical modulator on said substrate to receive and modulate at least a portion of said input light beam, and

29. The device as in claim 28, further comprising a circuit on said substrate coupled to control said optical modulator.

30. The device as in claim 28, further comprising an output optical coupler on said substrate to receive modulated light from said optical modulator and to direct modulated light off said substrate.